



Rural water supply services in Vanuatu in need of significant improvements

SUMMARY

This technical note examines the coverage and service levels for rural water supply in Vanuatu, an archipelago in the South Pacific. The Vanuatu Water Resources Management Act mandates that a full water resources inventory be conducted every five years. In preparation for the 2020/2021 inventory, an analysis was conducted of the 2014/2016 data. The assessment comprises information on more than 4,700 water sources across 44 islands. At that time, overall, 93% of water systems were functioning, and around 4 in 5 systems were deemed fully functional. While piped systems had the highest functionality rate (96%), around one-third were unable to provide a 24-hour supply. More than half of all systems (52%) failed to provide a year-round supply, with this issue being most acute for rainwater collection systems. When breakdowns occur, it takes on average more than a week to return the system to service. Community water committees were largely male dominated, with women making up less than a third of all committee membership. This is despite female representation being strongly associated with more reliable water services. Water users typically bear the responsibility for funding operation and maintenance costs, though a sizable proportion of committees did not have a system in place for collecting revenues. Water safety is a concern, particularly for the majority of spring-fed schemes and rainwater tanks that lacked adequate protection or treatment. While a high proportion of the rural population in Vanuatu have access to basic water supplies, significant improvements in the management, operation and maintenance of these systems are needed in order to make progress towards safely managed water services for all. In order to strengthen the evidence base for the next inventory design and share data openly, this data is being published. A comparison of these findings with current results, including a climate analysis will be forthcoming.

Introduction

This report summarises the coverage and service levels for rural water supplies in Vanuatu. Data underpinning the report was collected on water sources across 44 islands between 2014 and 2016. A range of data was captured by enumerators for each water supply system inspected, including technical, operational, financial and institutional attributes. The data was collected by a variety of students,

government and non-profit organization staff using Akvo FLOW in two separate campaigns: Shefa Province in mid-2014 and the remaining provinces between September 2015 and April 2016, after a category five cyclone response interrupted initial data collection plans. The second phase comprised a more comprehensive set of questions than the first. Although described as a national inventory, the data collection was not comprehensive, with coverage gaps in several areas, including the Banks Islands, north-west Tanna, western Santo, and small islands off north-west Malekula.

The analysis provided in the report focuses on: (i) the coverage of improved water supply systems; (ii) reliability of services; (iii) institutional arrangements; (iv) financial arrangements; and (v) sanitary conditions.

Water supply coverage

The inventory indicated that rural Vanuatu has a relatively high coverage of improved water supplies, although significant inequalities exist geographically. Across the country, 93% of surveyed water supplies were classified as improved¹, which is broadly consistent with the 2015 WHO/UNICEF Joint Monitoring Programme's (JMP) estimate that 89% of the rural population of Vanuatu has access to an improved water source. However, geographical disparities are evident, with province-level rates lying between 80% (Torba) and 97% (Penama) of surveyed water sources.

KEY POINTS

- Data collected on more than 4,700 water systems across 44 islands in rural Vanuatu between 2014 and 2016
- 93% of water systems were functioning, and around 4 in 5 systems were deemed fully functional
- Approximately one-third of piped supplies were not providing a 24-hour supply
- More than half (52%) of water systems were not providing a year-round supply
- Less than a third of water committee members were women, but those with female presentation oversaw more reliable water services
- Sanitary inspections indicate spring-fed systems and rainwater collection systems were at risk of microbial contamination
- Significant improvements in the management, operation and maintenance of rural water systems are needed to ensure safely managed water services

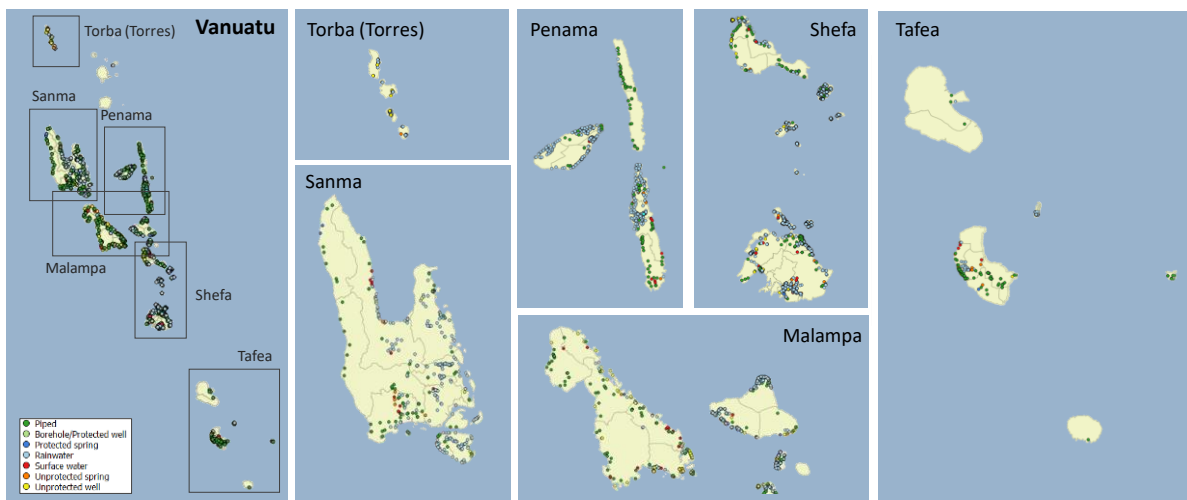
Table 1: Water supply systems by province in 2014 and 2016

Status	Malampa	Penama	Sanma	Shefa	Tafea	Torba	Total
Improved	1,335	544	446	1,742	197	82	4,346
Piped	112	102	78	100	107	0	499
Rainwater	1,181	439	264	1,467	51	77	3,479
Borehole/prot. well	38	3	102	172	37	5	357
Protected spring	4	0	2	3	2	0	11
Unimproved	184	19	30	99	15	20	367
Unprotected well	143	2	8	75	5	19	252
Unprotected spring	23	8	9	8	5	1	54
Surface water	18	9	13	16	5	0	61
Grand total	1,519	563	476	1,841	212	102	4,713
% unimproved	12%	3%	6%	5%	7%	20%	8%

Note: Coverage of data is incomplete for Torba, Tafea and Sanma provinces

¹ <https://washdata.org/monitoring/drinking-water>

Figure 1: Distribution of water sources in Vanuatu



Rural communities utilize a combination of groundwater, surface water, and rainwater, but in terms of the number of discrete water supplies, rainwater systems are most common. Over two-thirds of all surveyed water supplies were rainwater harvesting systems which made up more than three-quarters of all surveyed supplies in Malampa and Penama. By contrast, groundwater-based water points (boreholes and wells) were less common, comprising only 13% of surveyed systems. Likewise, piped systems made up just 11% of the surveyed water systems - of these, 54% were fed by springs, 32% by surface water, and 14% by groundwater from boreholes and wells.

On average, piped systems served more than double the number of people than other types of supplies (Figure 2b). Rainwater collection

systems served the least number of people on average, though there was great variation depending on the storage volume (Figure 2a). When comparing the total number of users from the inventory with household data from the recent census and Demographic Health Survey, there is consistency for piped supplies and groundwater-based water points (Figure 3). However, the inventory appears to have overestimated the use of rainwater sources and underestimated the use of surface water. The rainwater discrepancy may be due to double counting of users in the inventory as a result of households using both communal and private rainwater tanks. The underestimate for surface water may be linked to data coverage gaps in remote parts of Tanna and Santo where the use of surface water is widespread.

Figure 2a: Average number of individual users per water supply system, and (b) rainwater tank storage

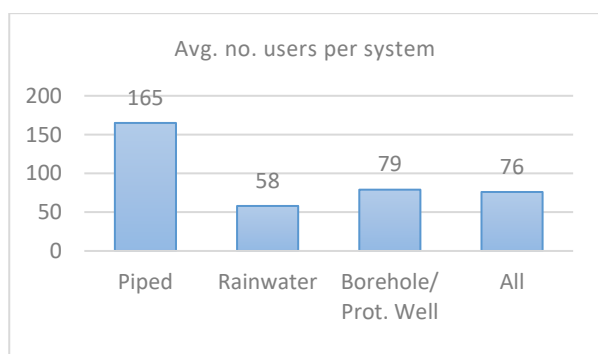
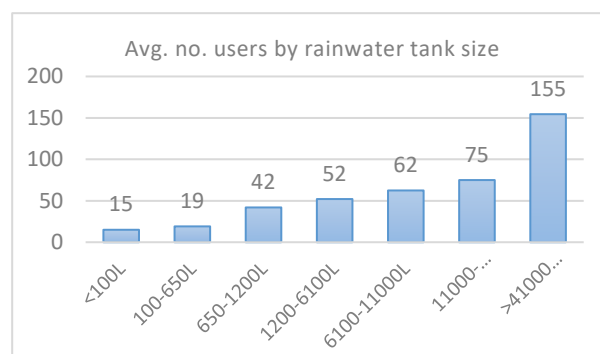


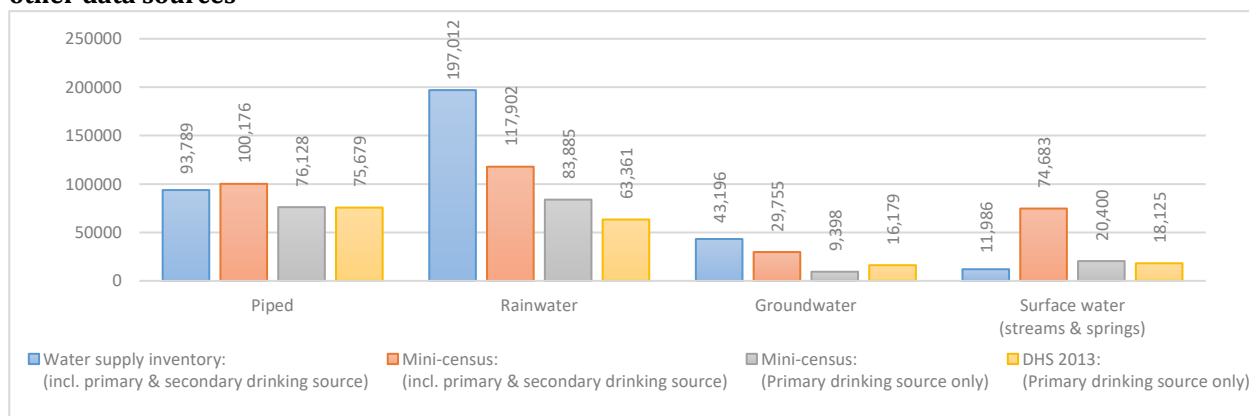
Figure 2b: Average number of individual users per rainwater tank storage



Accessibility of water on the premises is a key criterion for the ‘safely managed water service’ indicator against which progress towards Sustainable Development Goal target 6.1 will be measured². Of the improved water sources included in the inventory, privately-owned rainwater tanks were likely to be on premises, while a proportion of households accessing a piped system had water supplied to the yard or household. All told, the data suggest rural water systems provided drinking water to the premises for 37-43% of households. This is consistent with the JMP estimate of 43% of the rural population which is derived from household surveys and census data.

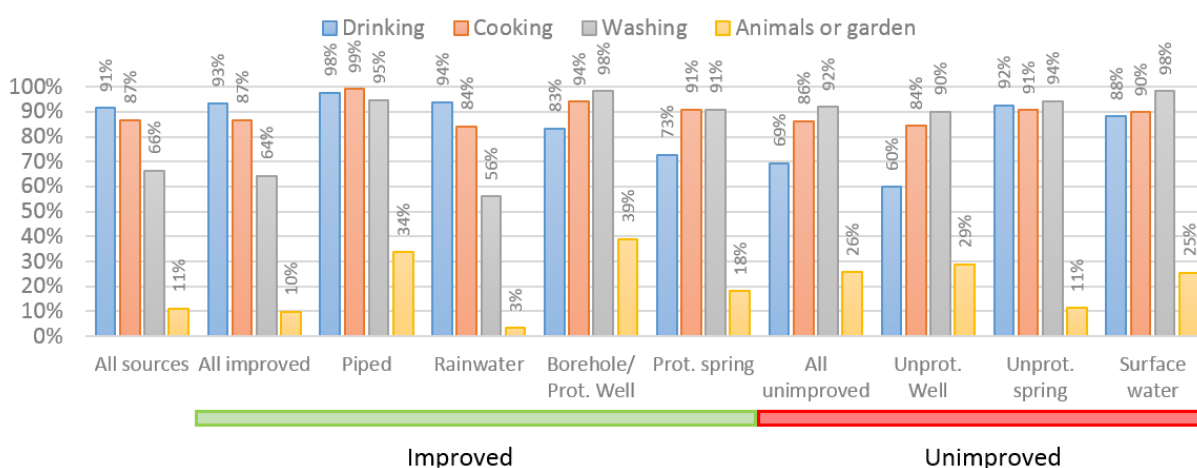
Water supplies in rural Vanuatu are used for a variety of purposes albeit to varying degrees. Piped water is commonly used for domestic purposes (drinking, cooking, and washing) whereas rainwater is largely reserved for drinking. Meanwhile, despite being improved water sources, protected wells and protected springs are used less for drinking compared to non-potable uses. These results support findings from elsewhere in the Pacific island region that rural communities draw on multiple improved and unimproved sources used for potable and non-potable needs.

Figure 3: Coverage of drinking water sources in rural areas inferred from water supply inventory vs. other data sources



Note: ‘Groundwater’ includes boreholes, protected wells and unprotected wells.

Figure 4: Percentage of water sources used for difference purposes



² As per <https://washdata.org/monitoring/drinking-water> an improved source must also meet two other criteria: water should be available when needed, and

the water supplied should be free from contamination.

Use of unimproved sources in Vanuatu is distributed unequally within and across different island groups. The inventory revealed widespread use of unprotected groundwater sources in coastal areas of Malekula and Torres. Use of surface water and unimproved springs was apparent in most islands, and was most prevalent in South and North Santo, Pentecost, Paama, and Efate. In contrast, in Ambae and Maewo there were few unimproved water sources used. Given

the rural water inventory is lacking data from several regions, it is useful to triangulate results with Vanuatu's 2016 census (Figure 6). This corroborates some of the observations regarding areas of surface water use, but also highlights additional problem areas that the inventory does not. Census results also show a high prevalence of surface water use in Vanua Lava, West Santo and parts of Tanna Island.

Figure 5: Unimproved water sources used for drinking by province (rural water supply inventory) with size of water representing number of users of each unimproved water source

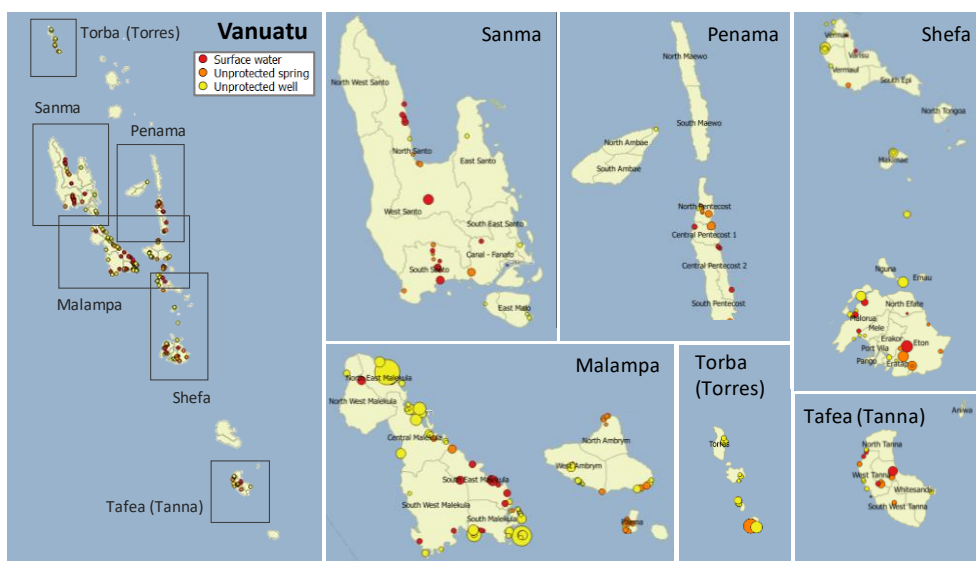
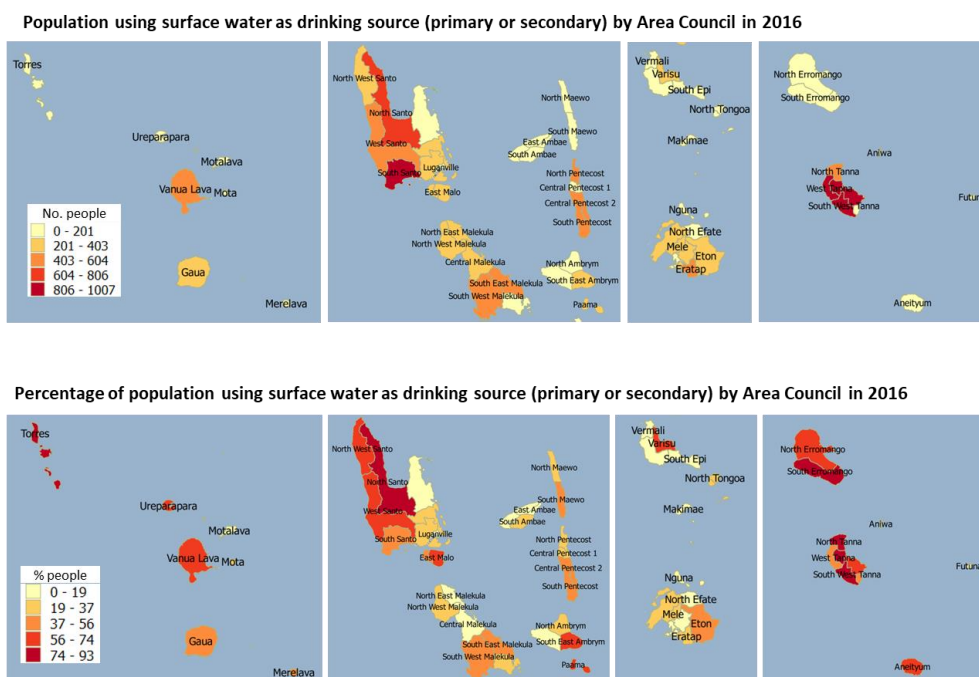


Figure 6: Population using unimproved water sources for drinking (2016 Mini-Census)



Reliability of services

Overall, 93% of water supply systems were functioning, and around 4 in 5 systems were deemed fully functional (Figure 7). Piped systems appear to be the least likely to be non-functional, but also more likely to have some operational problems (i.e. only partially functional). Just 4% of surveyed piped systems were non-functional, but almost one in three had some problem that limited its functionality. Boreholes and protected wells had the poorest functionality rate which likely reflects limited supply chains for handpump spare parts. Not surprisingly, non-functionality rates tended to increase with the age of the system (Figure 7).

Community-owned systems were more likely to have issues impairing their functionality than privately-owned or institutionally-owned systems, such as those owned by schools and health facilities. (Figure 8). However, performance of community-owned systems improved when a management committee was in place. There was no clear association between functionality rate and the size of the user group. For piped supplies, the proportion of operational taps tended to be higher for system that drew on groundwater, were newer, and served smaller user groups (Figure 9).

Table 2: Functionality definitions used for analysis

Functionality category used for analysis	Functionality category used for data collection	Definition
Fully functional	Good	In good working condition, minor repairs may be required that can be managed locally
Partially functional	Fair	Minor problems and repairs needed, may require external assistance
	Poor	Barely functioning, major repairs needed, will require external assistance
Non-functional	Not working	Not working

Figure 7: Functionality by system type and age

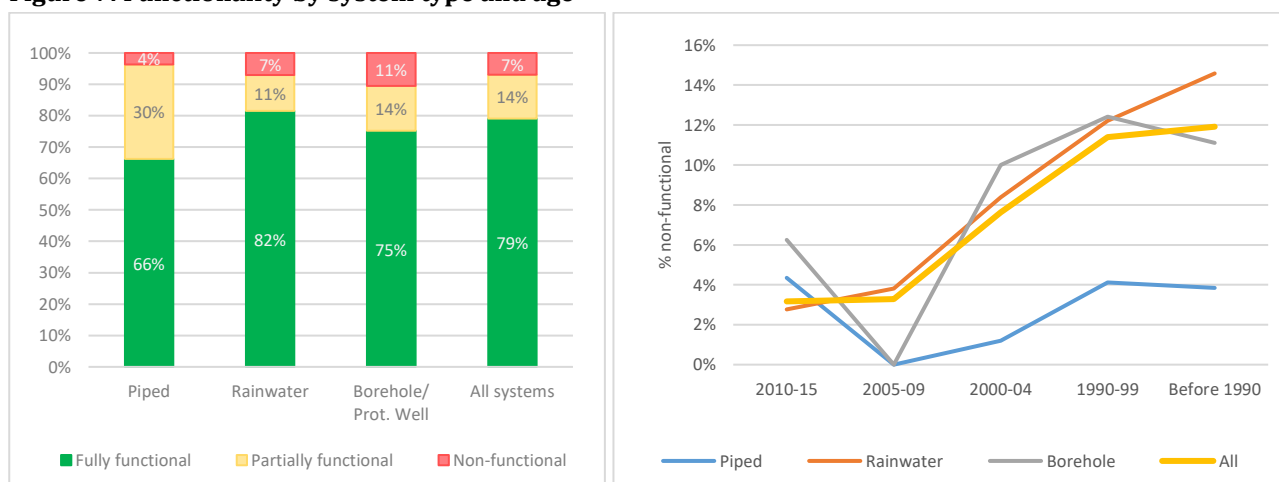


Figure 8: Functionality of water supply systems by ownership, management and user group size

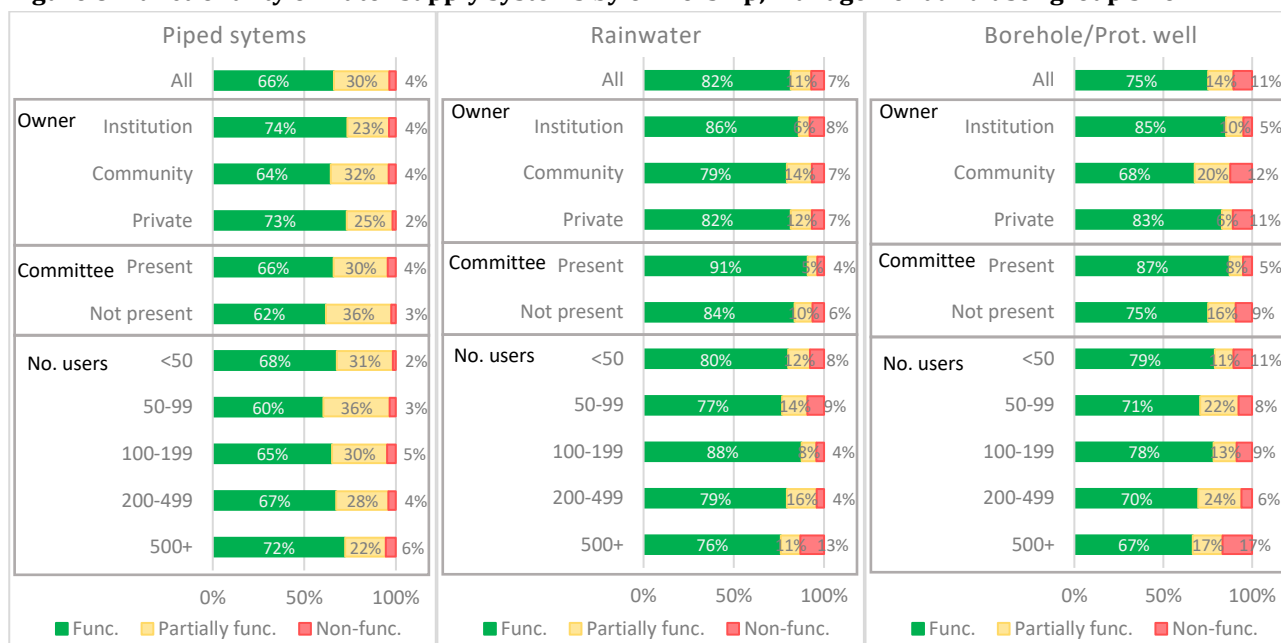
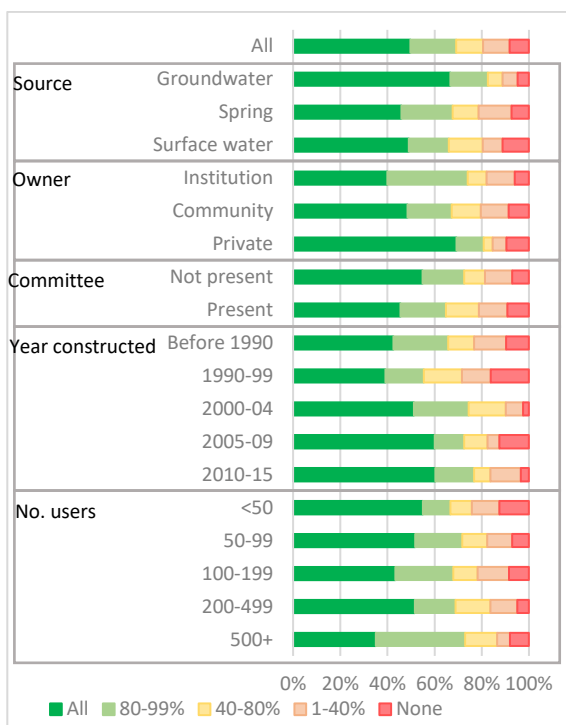
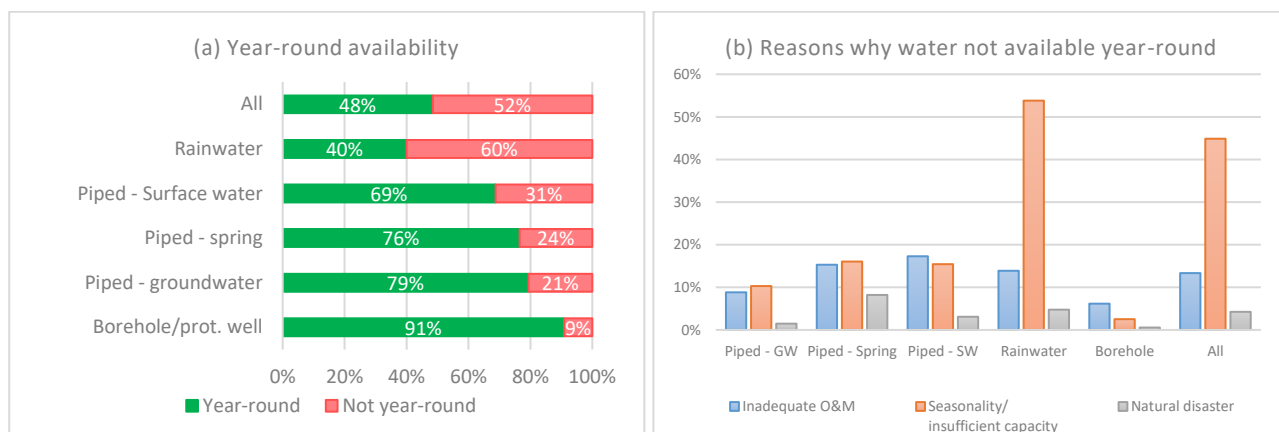


Figure 9: Percentage of taps working for piped systems



More than half of improved water sources in the inventory failed to provide a year-round supply (Figure 10). Groundwater-based systems - both piped schemes and standalone water points - performed the best, while rainwater systems performed the worst. This finding is not surprising given rainwater collection systems are highly sensitive to seasonal variations in rainfall, whereas rainfall variation has more of an attenuated impact on surface water flow, and an even more attenuated impact on groundwater availability. Around 1 in 7 systems did not provide a year-round supply due to inadequate operation and maintenance. Natural disasters had a lower impact on year-round availability, but this was a notable issue for piped systems with a spring source. In contrast, groundwater-based systems (both piped and water points) appeared quite resilient against natural hazards.

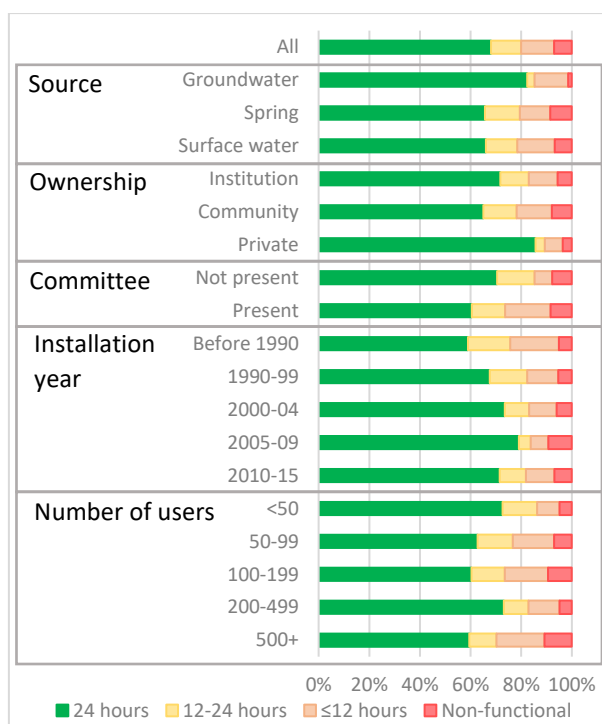
Figure 10: Percentage of water supply systems (a) not providing a year-round supply, and (b) not providing a year-round supply for specific reasons



Regarding day-to-day continuity of supply, around two-thirds of piped systems (68%) provided a 24-hour service (Figure 11). The likelihood of a 24-hour supply was higher for systems pumping groundwater as well as those more recently constructed. Community-owned systems had poorer continuity compared to institution and private management models.

However, among community-owned systems, continuity of water service was worse when a management committee was in place. One possible explanation for this counterintuitive result is that communities are less motivated to form water committees if they have continuous water services and become more motivated when continuity problems need to be addressed.

Figure 11: Continuity of piped water services (hours of supply per day)

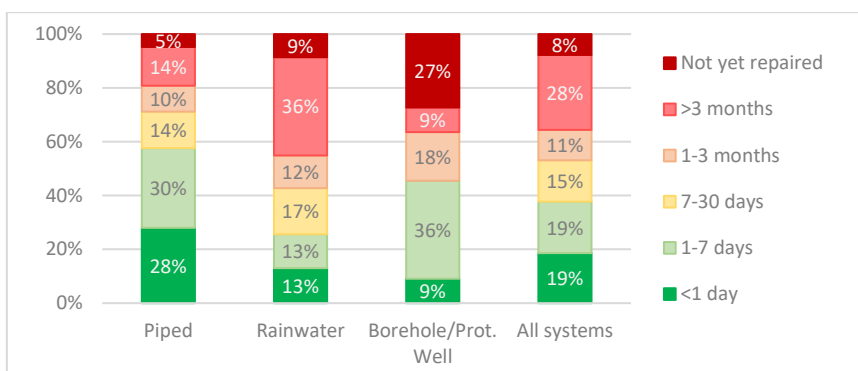


Repair time

The amount of time taken to repair water supply systems is a major issue (Figure 12). Just 38% of needed repairs were made within a week and nearly half of them took over a month to be made. Repair times were fastest for piped systems. A relatively high proportion (27%) of boreholes and protected wells needed repairs

that had not yet been carried out (27%), which likely reflects the limited supply chains for accessing replacement parts. Meanwhile, a relatively large proportion (36%) of repairs to rainwater collection systems took more than three months to be made.

Figure 12: Repair times for water supply systems when a breakdown occurs

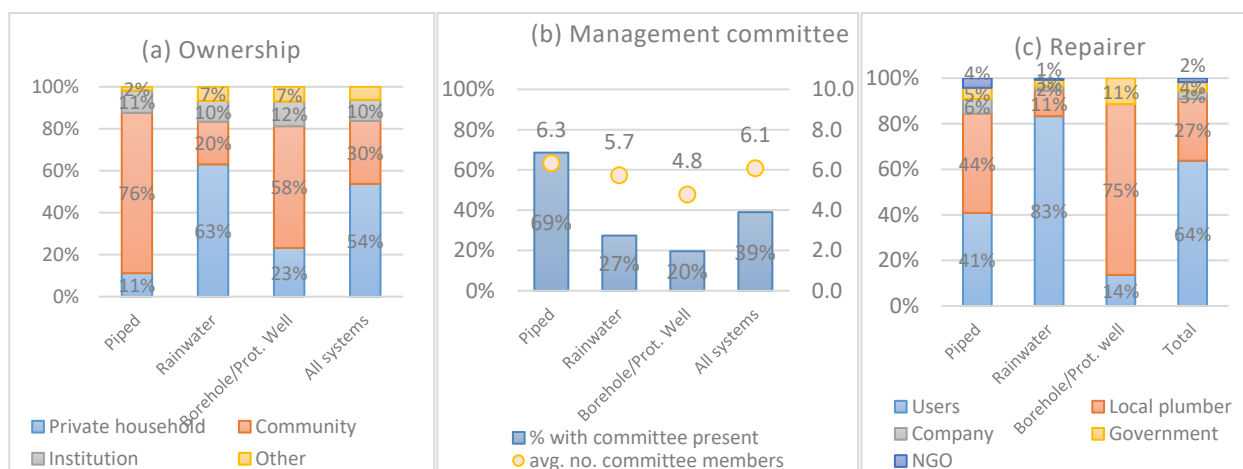


Institutional arrangements

Ownership arrangements for rural water supply systems vary by scheme type (Figure 13). Piped systems and groundwater-based water points tended to be owned by user communities, whereas rainwater collection systems were more commonly owned and managed by individual households. Despite commonly being owned by the community, the proportion of boreholes and

protected wells with a management committee was strikingly low. Committees typically had between 4 and 7 members. More often than not, it is the users themselves who carried out repairs, particularly for rainwater collection systems; piped systems and groundwater-based water points were more commonly dependent on a local technician.

Figure 13: Water supply systems by (a) ownership arrangements, (b) prevalence of management committees, and (c) responsibilities for conducting maintenance and repairs



Similar to a research conducted with this data in 2017³, gender inequalities were evident in water governance and decision-making, with 27% of water committees lacking a female member and 48% lacking a female in a key position within the committee (Figure 14). Moreover, women on average made up less than a third of committee members. Women were included in much greater proportions on the committees of rainwater and groundwater systems than piped systems. This is

despite the fact piped water systems exhibited better operational performance when women were involved in their management and decision making (Figure 15). This relationship holds for multiple measures of water service reliability, and the effect is most pronounced when women occupy key positions. This supports wider evidence in the WASH sector that the inclusion of women in water management and decision-making improves water service sustainability.

Figure 14: Participation of women in water committees

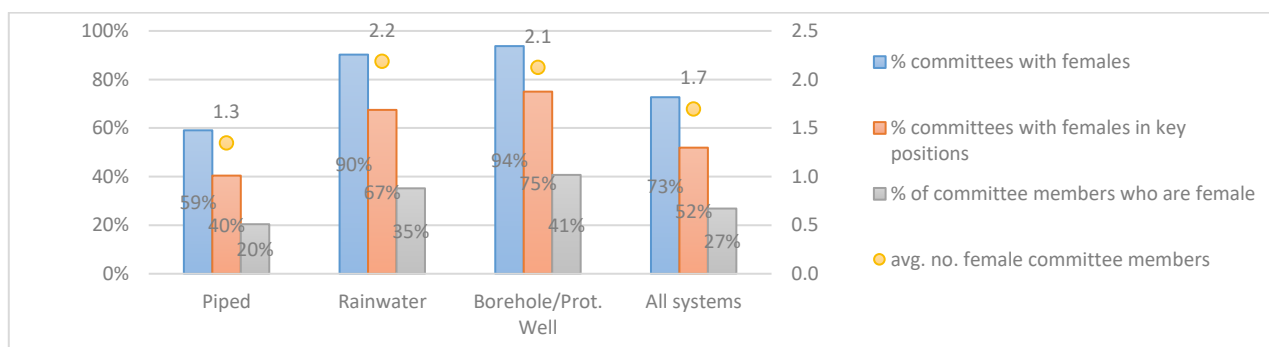
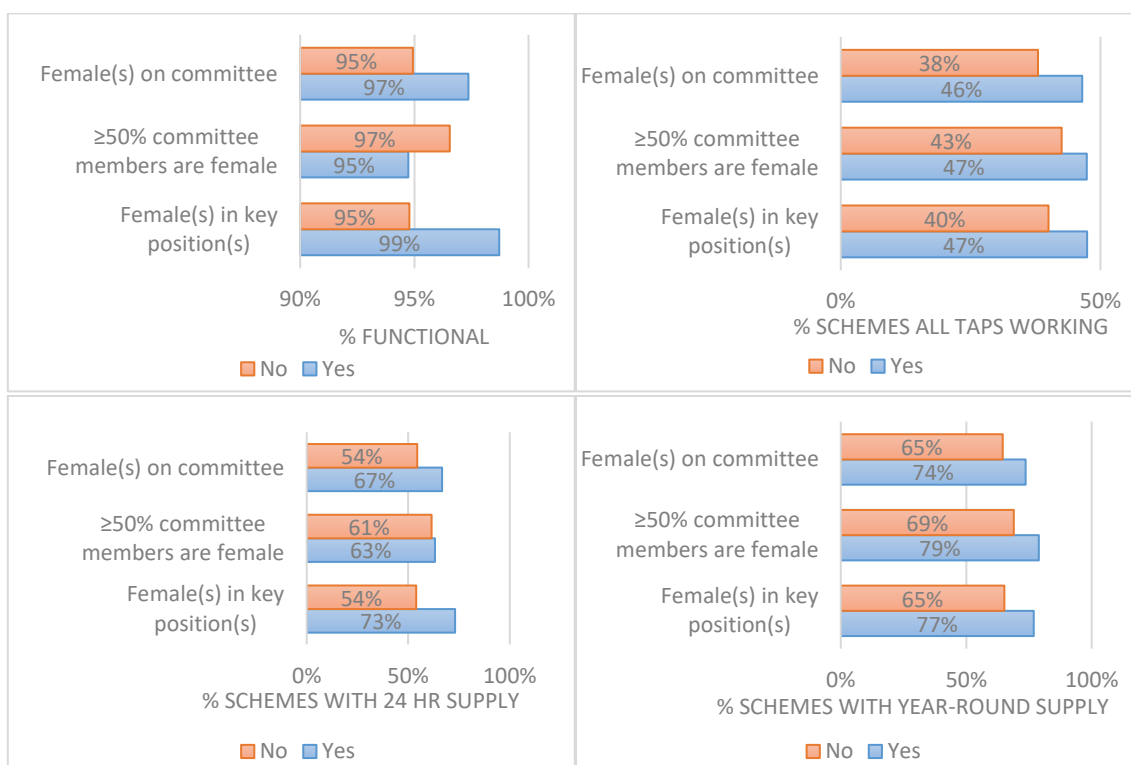


Figure 15: Participation of women in water committees and its relationship with piped water service reliability



³ www.developmentbookshelf.com/doi/full/10.3362/1756-3488.16-0002

Funding arrangements

The initial construction of piped water supply systems was typically funded by external sources (government and donors/NGOs) while operation and maintenance was more commonly funded by users (Figure 16). In contrast, rainwater systems were more often funded by private households. While in theory, water users bear the

responsibility for funding operation and maintenance, in reality only 56% of systems had in place a form of revenue collection (Figure 17). When fees were collected, the majority of piped water tariffs amount to less than 500 Vatu (\$4.37 USD) per household per year.

Figure 16: Sources of (a) capital expenditure and (b) operational expenditure

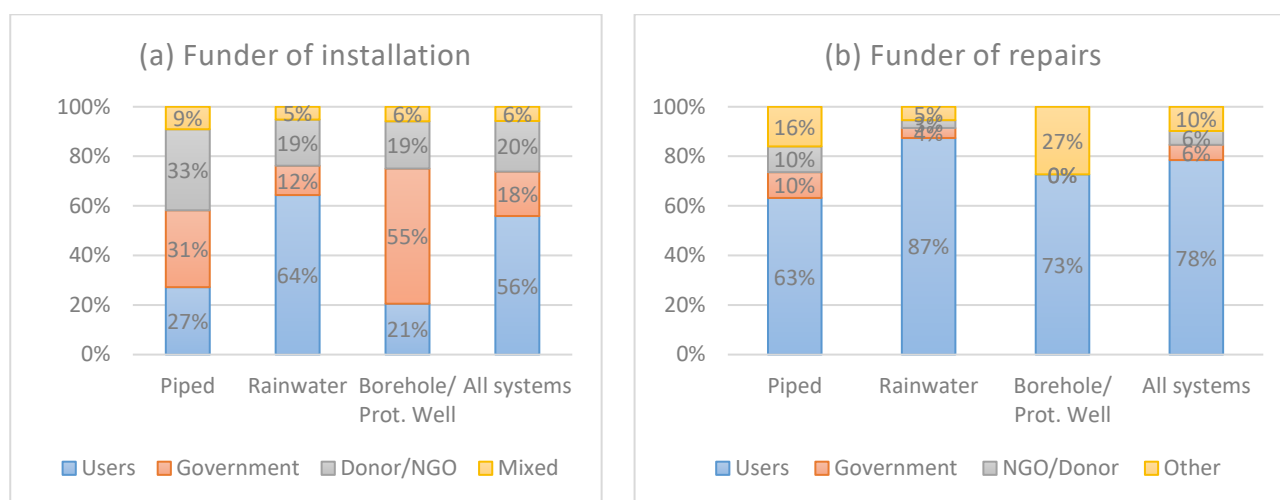
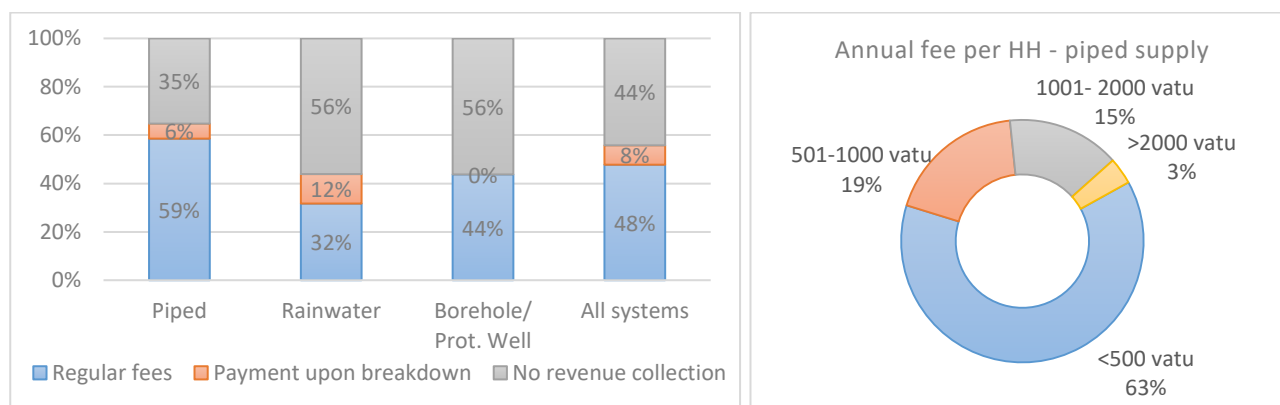


Figure 17: Type and amount of user fee collection



Sanitary conditions

The majority of piped schemes were fed by surface water and springs, and these face various sanitary risks (Table 2). Most surface water sources did not have an intake protected by screening, and 23% had farm animals upstream. Likewise, a majority of springs lacked proper protection. Rainwater collection systems also had problematic sanitary characteristics (Table 3). Only half of the surveyed rainwater systems

had a sealed lid on the storage tank, most did not have an inlet filter and two thirds required a rope and bucket to retrieve water. The private rainwater systems presented greater sanitary risks than public systems. Of biggest concern for groundwater-based schemes was that 10-20% had a toilet within 10m of the abstraction point (Table 4).

Table 2: Sanitary characteristics of piped schemes fed by surface water and spring water

Sanitary characteristic	% of systems with characteristic
Surface water piped schemes	
No houses upstream	93%
No farm animals upstream	77%
Intake fenced	9%
Intake screened	26%
Spring-fed piped schemes	
Protected	40%
Protected and fenced	2%
Protected and no toilet uphill	39%
Protected, fenced and no toilet uphill	2%

Note: Excludes Shefa province as data on sanitary characteristics were not collected.

Table 3: Sanitary characteristics of rainwater tanks

Sanitary characteristic	% of systems with characteristic		
	Public	Private	All
Above-ground tank	78%	37%	54%
No visible contamination on roof	45%	30%	36%
Clean gutter	51%	39%	44%
Inlet filter	49%	19%	31%
Sealed lid present	63%	39%	49%
Water extracted via tap or pump	50%	18%	31%

Note: Public rainwater tank defined as one owned by the community, NGO, institution or church. Private rainwater tank defined as one owned by private household(s). Excludes Shefa province as data on sanitary characteristics were not collected.

Table 4: Sanitary characteristics of groundwater-based systems

Sanitary characteristic	% of systems with characteristic	
	Piped	Borehole/protected well
No toilet within 10m	89%	80%
No uphill toilet within 50m	79%	75%
Fence	48%	5%
Apron >1m	50%	77%

Note: Excludes Shefa province as data on sanitary characteristics were not collected.

Conclusion

In Vanuatu, in 2014 and 2016, 89% of the rural population accesses an improved water source. However, the high level of improved water coverage conceals issues that pose a significant impediment to achieving safely managed water services. The rural water inventory data reveal a range of service delivery challenges. Failure to provide a year-round supply is a particular point of concern as it affects more than half of all water systems. A fifth of all systems exhibited operational problems, and when breakdowns have occurred, they have often resulted in lengthy interruptions in service delivery. Greater female representation on management committees and in key positions is needed, and this will likely yield operational improvements. The poor sanitary conditions of infrastructure present water quality risks. Significant improvements in the management, operation and maintenance of these systems are needed in order to achieve safely managed water services in rural Vanuatu. This analysis is published now, in preparation for the 2020/2021 inventory to improve the next round of data collection and strengthen the evidence base on key challenges and opportunities for the rural water sector. Given the frequency and severity of natural hazards in Vanuatu, as well as the importance of climate resilient WASH programming, climate aspects will be a particular focus of future analysis.

Photo Credits

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